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PATENT

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of :  
Toshiaki KIMURA et al. : Confirmation Number: 3275  
Serial Number: 10/525,092 : Group At Unit: 1796  
Filed: February 23, 2005 : Examiner: Alicia M. Toscano  
For: POLYLACTIC ACID FIBER, YARN PACKAGE, AND TEXTILE  
PRODUCTS

DECLARATION UNDER RULE 37 C.F.R. 1.132

Commissioner for Patent  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir,

I, Katsuhiko Mochizuki, do hereby declare as follow:

1. That I am a citizen of Japan, residing at D-73, Yoroizaka, 12-3, Bunkyo-cho 2-chome, Mishima-shi, Shizuoka 411-0033 Japan (moved from Toray Asahigaoka Apartment 11, 459-2, Kawaharagaya, Mishima-shi, Shizuoka 411-0022 Japan, at the time of filing of the above-identified subject application); that in March 1997, I graduated from the Bachelor Course in the Department of Mechanical Engineering, Faculty of Engineering, Toyohashi University of Technology; Aichi, Japan; that since April 1997, I have been employed by Toray Industries, Inc., a Japanese corporation, of 2-1, Nihonbashi Muromachi 2-chome, Tokyo 103-8666 Japan, the assignee of record in the above-identified subject application; and that in the above-named corporation, I was engaged in research and development mainly in the field of synthetic fibers for clothing during a

time of April 2002 to September 2002, and since April 1997, have been engaged in research and development mainly in the field of functional fibers containing polylactic acid fibers up to present.

2. That I am one of the six inventors of the invention described and claimed in the subject United States Patent Application Serial Number 10/525,092 identified above (hereinafter referred to as the present application) and as such, am fully familiar with the invention of the present application (hereinafter referred to as the present invention) as well as Nishimura (JP 2001-131827), Tan (WO 02/12395. US 6710135), Kondo (US 5593778) and Zeitler (US 5811508), cited by the Examiner in the Office Action dated December 21, 2007.

3. That at this time I directed and supervised the carrying out of experiments which are fully described in hereto attached sheets, the purpose of which being to testify that by spinning the polylactic acid resin composition disclosed in Nishimura according to the melt spinning method disclosed in Tan to attain the single fiber fineness disclosed in Kondo, it is impossible to provide such a melt-spun fiber having remarkable properties in respect of such as the passability through processing steps, the solidity to friction, the color tone and the dyeing unevenness, as obtainable according to the present invention.

### EXPERIMENTS

#### Preparation of polylactic acid resin compositions:

As shown in detail in Table 1 below, there were prepared a polylactic acid resin composition containing ethylenebis(stearamide) (melting point: 144 °C) according to claim 1 of the present invention, as Additional Example, and three kinds of polylactic acid resin compositions containing erucamide (melting point: 80 °C) disclosed in Examples 1-3 of Nishimura, as Additional Comparative Examples. Except that ethylenebis(stearamide) is substituted for the erucamide, the polylactic acid resin composition of the Additional Example is identical with the polylactic acid resin composition of the Additional Comparative Example 2.

In Table 1, used for the polylactic acid is 6201 D (number

average molecular weight: 100,000, and D-lactic acid: 1 mol %), a product of Nature Works LLC, and used for poly(butylene succinate adipate), is Bionolle, a product of SHOWA HIGHPOLYMER CO., LTD.

Melt spinning:

The 4 kinds of polylactic acid resin compositions were spinning temperature of 220 °C to obtain fibers of a single fiber fineness of 7.0 dtex, and there were provided multifilament yarns having a filament number of 12 and a total yarn fineness of 84 dtex.

Comparative evaluations:

The above provided polylactic fibers were woven to cloths over a water-jet loom, of which comparative evaluations were conducted in respect of the raw yarn properties and the cloth properties as entered in Table 1 according to the same evaluation methods that are described in paragraphs [0200] to [0231] of the specification of the present application.

CONSIDERATIONS

As clearly seen from Table 1, in connection with the Additional Example (representing the present invention), the polylactic acid fiber obtained had a b\* value (color tone property) of 1.4, the colored cloth had a solidity to dry friction and that to wet friction of a grade 4 and a remarkable property in respect of the coloring unevenness, the frequency of yarn break during spinning was 0 (times/t), the yarn superiority ratio was 98 % and the frequency of halt of loom was 2 times/day/loom. In contrast to the above, in the cases of Additional Comparative Examples 1-3, the polylactic acid fiber obtained had a b\* value (color tone property) of 5.4 to 7.5, the solidity to dry friction and that to wet friction of the cloths were so low as to be grade 1-2, the dyed cloths showed a large extent of dyeing unevenness, the frequency of the yarn break during spinning was 1-3 times/t, the yarn superiority ratio was 85-93 % and the frequency of halt of loom was 4-6 times/day/loom, so that pursuant to any of the Additional Comparative Examples 1-3, the objects of the present invention cannot be realized.

The above-described results of Experiments at this time are

believed to clearly evidence that the polylactic acid fiber according to claim 1 of the present application can never be provided even if the polylactic acid resin composition having the carboxyl end-group concentration disclosed in Nishimura and taught by Zeitler is spun according to the melt-spinning method taught by Tan in a manner to attain the monofilament fineness taught by Kondo.

Table 1

		Additional Coparative Examples			Additional Example	
		1	2	3		
Polymer composition	Poly(lactic acid	(wt%)	90	98	89.5	98
	Poly(butylene succinate adipate)	(wt%)	8	0	8	0
	Euramide	(wt%)	0.5	2	1	0
	Ethylenebis(stearamide)	(wt%)	0	0	0	2
	Silica	(wt%)	0.5	0	0.5	0
Properties of raw yarn	Total fineness of multifilament	(dtex)	84	84	84	84
	NUMBER of filaments		12	12	12	12
	Single fiber fineness	(dtex)	7.0	7.0	7.0	7.0
	b* value		6.6	5.4	7.5	1.4
	Carboxyl end group concentration	(eq/l)	35	37	33	35
	Strength	(cN/dtex)	3.2	3.4	3.0	3.5
	Elongation	(%)	34	37	32	38
	Boiling-water shrinkage rate	(%)	21	7	22	8
	U% normal	(%)	2.3	1.8	2.8	0.8
	Exothermic peak of crystallization In a temperature decrease	(°C)	NA	117	NA	127
Properties of cloth	Solidity to dry friction	(grade)	2	2	2	4
	Solidity to wet friction	(grade)	1	2	1	4
	Dyeing unevenness		Δ	X	Δ	⊙
	Yarn breaks during spinning	(time/l)	2	1	3	0
	Draw superiority ratio	(%)	88	93	85	98 <sup>c</sup>
	Halt of loom	(times/day/loom)	6	4	4	2

The undersigned declarant declare further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful, false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful, false statements may jeopardize the validity of the above identified application or any patent issuing thereon.

Dated: *March 19, 2008*

*Katsuhiko Mochizuki*

Katsuhiko Mochizuki